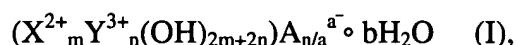


What is claimed is:

1. A method for reducing the concentration of sulfur in gasoline produced in an FCC unit comprising:

(a) adding to the FCC unit during an FCC process cycle an effective amount of one or more shaped bodies, comprising

a hydrotalcite like compound of formula (I):



where X is magnesium, calcium, zinc, manganese, cobalt, nickel, strontium, barium, copper or a mixture of two or more thereof; Y is aluminum, manganese, iron, cobalt, nickel, chromium, gallium, boron, lanthanum, cerium or a mixture of two or more thereof; A is CO₃, NO₃, SO₄, Cl, OH, Cr, I, SiO₃, HPO₃, MnO₄, HGaO₃, HVO₄, ClO₄, BO₃, or a mixture of two or more thereof; a is 1, 2 or 3; b is between 0 and 10; and m and n are selected so that the ratio of m/n is about 1 to about 10; said hydrotalcite like compound prepared by a process comprising:

- (1) reacting an aqueous mixture comprising at least one divalent metal compound and at least one trivalent metal compound to produce a mixed metal oxide compound in the form of an aqueous slurry;
- (2) optionally heat treating the mixed metal oxide compound from step (a) at a temperature up to about 225°C;
- (3) drying the heat-treated compound from step (a) or step (b) to produce one or more shaped bodies suitable for use in the reduction of sulfur from gasoline;
- (4) heat treating the shaped bodies from step (c) at a temperature of about 300°C or higher to produce one or more calcined shaped bodies;
- (5) hydrating the calcined shaped bodies from step (d) to produce a hydrotalcite like compound; and

- (6) optionally heating the hydrotalcite like compound to remove substantially all of the interstitial water and/or anions to produce a collapsed hydrotalcite like compound;

wherein the hydrotalcite like compound has an x-ray diffraction (XRD) pattern which has a 2 theta peak position nearly identical to that found in an ICDD card selected from ICDD card 35-965; ICDD Card No. 35-1275; or ICDD Card No. 35-0964; and

- (b) reducing the sulfur content of gasoline undergoing cracking during the FCC process cycle.

2. The method according to claim 1, wherein X is magnesium (Mg) and Y is aluminum (Al).

3. The method according to claim 2, wherein the molar ratio of Mg:Al is from 1:1 to 10:1; and wherein the hydrotalcite like compound has an X-ray diffraction (XRD) pattern displaying at least a reflection at a two theta peak position between 8 and 15 degrees.

4. The method according to claim 1, further comprising at least one metallic oxidant, wherein the metal in the metallic oxidant is selected from antimony, bismuth, cadmium, chromium, cobalt, copper, dysprosium, erbium, europium, gadolinium, germanium, gold, holmium, iridium, iron, lanthanum, lead, manganese, molybdenum, neodymium, nickel, niobium, osmium, palladium, platinum, praseodymium, promethium, rhenium, rhodium, ruthenium, samarium, scandium, selenium, silicon, silver, sulfur, tantalum, tellurium, terbium, tin, titanium, tungsten, thulium, ytterbium, yttrium, zinc, or a mixture of two or more thereof;

5. The method according to claim 4, wherein the at least one metallic oxidant is present in an amount of at least 15% by weight, calculated as the oxide equivalent.

6. The method according to claim 1, wherein the shaped bodies further comprise a support.

7. The method according to claim 5, wherein the support comprises a spinel, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium aluminate, hydrous magnesium silicate, magnesium silicate, magnesium calcium silicate, aluminum silicate, calcium silicate, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, an aluminum hydroxide compounds, an aluminum-containing metal oxide compound other than alumina or an aluminum hydroxide compound, aluminum chlorohydrate, silica, silicon-containing compound other than silica, silica/alumina, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof.

8. The method according to claim 1, wherein the divalent metal cation in the divalent metal compound of the process step (1) is selected from Mg^{2+} , Ca^{2+} , Zn^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Sr^{2+} , Ba^{2+} , Cu^{2+} or a mixture of two or more thereof.

9. The method according to claim 1, wherein the trivalent metal cation in the trivalent metal compound of the process step (1) is selected from Al^{3+} , Mn^{3+} , Fe^{3+} , Co^{3+} , Ni^{3+} , Cr^{3+} , Ga^{3+} , B^{3+} , La^{3+} , Gl^{3+} , Ce^{3+} , or a mixture of two or more thereof.

10. The method according to claim 1, wherein the divalent metal compound in the process of step (1) is selected from magnesium oxide, magnesium hydroxy acetate, magnesium acetate, magnesium hydroxide, magnesium nitrate, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium chloride, magnesium aluminate, hydrous magnesium silicate, magnesium calcium silicate, and mixtures of two or more thereof.

11. The method according to claim 1, wherein the trivalent metal compound in the process of step (1) is selected from aluminum hydroxide hydrate, aluminum oxide, aluminum acetate, aluminum nitrate, aluminum hydroxide, aluminum carbonate, aluminum formate, aluminum chloride, hydrous aluminum silicate, aluminum calcium silicate, and mixtures of two or more thereof.

12. The method according to claim 1, wherein, in the process of step (1), in the mixed metal oxide compounds, the ratio of the divalent metal cation to the trivalent metal cation is selected from about 1:1 to about 10:1; from about 1:1 to about 6:1; from about 1.5:1 to about 6:1; or from about 2:1 to about 5:1.

13. The method according to claim 1, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount selected from of least 1 ppm, at least 2 ppm, or at least 5 ppm.

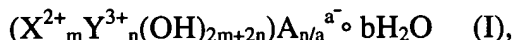
14. The method according to claim 1, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount of about 5% or more of the inventory of the regenerator.

15. The method according to claim 1, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount of about 10% or more of the inventory of the regenerator.

16. A method for reducing the concentration of sulfur in gasoline produced in an FCC unit comprising:

(a) adding to the FCC unit during an FCC process cycle an effective amount of one or more shaped bodies, comprising

(i) a hydrotalcite like compound of formula (I):



where X is magnesium, calcium, zinc, manganese, cobalt, nickel, strontium, barium, copper or a mixture of two or more thereof; Y is aluminum, manganese, iron, cobalt, nickel, chromium, gallium, boron, lanthanum, cerium or a mixture of two or more thereof; A is CO₃, NO₃, SO₄, Cl, OH, Cr, I, SiO₃, HPO₃, MnO₄, HGaO₃, HVO₄, ClO₄, BO₃, or a mixture of two or more thereof; a is 1, 2 or 3; b is between 0 and 10; and m and n are selected so that the ratio of m/n is about 1 to about 10; said hydrotalcite like compound prepared by a process comprising:

(1) reacting an aqueous mixture comprising at least one divalent metal compound and at least one trivalent metal compound to produce a mixed metal oxide compound in the form of an aqueous slurry;

- (2) optionally heat treating the mixed metal oxide compound from step (a) at a temperature up to about 225°C;
- (3) drying the heat-treated compound from step (a) or step (b) to produce one or more shaped bodies suitable for use in the reduction of sulfur from gasoline;
- (4) heat treating the shaped bodies from step (c) at a temperature of about 300°C or higher to produce one or more calcined shaped bodies;
- (5) hydrating the calcined shaped bodies from step (d) to produce a hydrotalcite like compound; and
- (6) optionally heating the hydrotalcite like compound to remove substantially all of the interstitial water and/or anions to produce a collapsed hydrotalcite like compound;

wherein the hydrotalcite like compound has an x-ray diffraction (XRD) pattern which has a 2 theta peak position nearly identical to that found in an ICDD card selected from ICDD card 35-965; ICDD Card No. 35-1275; or ICDD Card No. 35-0964; and

(ii) at least one metallic oxidant, wherein the metal in the metallic oxidant is selected from antimony, bismuth, cadmium, chromium, cobalt, copper, dysprosium, erbium, europium, gadolinium, germanium, gold, holmium, iridium, iron, lanthanum, lead, manganese, molybdenum, neodymium, nickel, niobium, osmium, palladium, platinum, praseodymium, promethium, rhenium, rhodium, ruthenium, samarium, scandium, selenium, silicon, silver, sulfur, tantalum, tellurium, terbium, tin, titanium, tungsten, thulium, ytterbium, yttrium, zinc, or a mixture of two or more thereof; and

(b) reducing the sulfur content of gasoline undergoing cracking during the FCC process cycle.

17. The method according to claim 16, wherein X is magnesium (Mg) and Y is aluminum (Al).

18. The method according to claim 17, wherein the molar ratio of Mg:Al is from 1:1 to 10:1; and wherein the hydrotalcite like compound has an X-ray diffraction (XRD) pattern displaying at least a reflection at a two theta peak position between 8 and 15 degrees.
19. The method according to claim 16, wherein the at least one metallic oxidant is present in an amount of at least 15% by weight, calculated as the oxide equivalent.
20. The method according to claim 16, wherein the shaped bodies further comprise a support.
21. The method according to claim 20, wherein the support comprises a spinel, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium aluminate, hydrous magnesium silicate, magnesium silicate, magnesium calcium silicate, aluminum silicate, calcium silicate, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, an aluminum hydroxide compounds, an aluminum-containing metal oxide compound other than alumina or an aluminum hydroxide compound, aluminum chlorohydrate, silica, silicon-containing compound other than silica, silica/alumina, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof.
22. The method according to claim 16, wherein the divalent metal cation in the divalent metal compound of the process step (1) is selected from Mg^{2+} , Ca^{2+} , Zn^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Sr^{2+} , Ba^{2+} , Cu^{2+} or a mixture of two or more thereof.
23. The method according to claim 16, wherein the trivalent metal cation in the trivalent metal compound of the process step (1) is selected from Al^{3+} , Mn^{3+} , Fe^{3+} , Co^{3+} , Ni^{3+} , Cr^{3+} , Ga^{3+} , B^{3+} , La^{3+} , Gl^{3+} , Ce^{3+} , or a mixture of two or more thereof.
24. The method according to claim 16, wherein the divalent metal compound in the process of step (1) is selected from magnesium oxide, magnesium hydroxy acetate, magnesium acetate, magnesium hydroxide, magnesium nitrate, magnesium hydroxide, magnesium carbonate,

magnesium formate, magnesium chloride, magnesium aluminate, hydrous magnesium silicate, magnesium calcium silicate, and mixtures of two or more thereof.

25. The method according to claim 16, wherein the trivalent metal compound in the process of step (1) is selected from aluminum hydroxide hydrate, aluminum oxide, aluminum acetate, aluminum nitrate, aluminum hydroxide, aluminum carbonate, aluminum formate, aluminum chloride, hydrous aluminum silicate, aluminum calcium silicate, and mixtures of two or more thereof.

26. The method according to claim 16, wherein, in step (1) of the process, in the mixed metal oxide compounds, the ratio of the divalent metal cation to the trivalent metal cation is selected from about 1:1 to about 10:1; from about 1:1 to about 6:1; from about 1.5:1 to about 6:1; or from about 2:1 to about 5:1.

27. The method according to claim 16, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount selected from of least 1 ppm, at least 2 ppm, or at least 5 ppm.

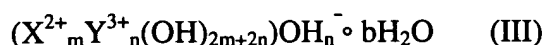
28. The method according to claim 16, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount of about 5% or more of the inventory of the regenerator.

29. The method according to claim 16, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount of about 10% or more of the inventory of the regenerator.

30. A method for reducing the concentration of sulfur in gasoline produced in an FCC unit comprising:

(a) adding to an FCC unit during an FCC process cycle an effective amount of one or more shaped bodies, comprising:

a hydrotalcite like compound of formula (III):



wherein X is magnesium, calcium, zinc, manganese, cobalt, nickel, strontium, barium, copper or a mixture of two or more thereof; Y is aluminum, manganese, iron, cobalt, nickel, chromium, gallium, boron, lanthanum, cerium or a mixture of two or more thereof; b is between 0 and 10; and m and n are selected so that the ratio of m/n is about 1 to about 10; said hydrotalcite like compound prepared by a process comprising:

- (1) reacting an aqueous mixture comprising at least one divalent metal compound and at least one trivalent metal compound to produce a mixed metal oxide compound in the form of an aqueous slurry;
- (2) optionally heat treating the mixed metal oxide compound from step (a) at a temperature up to about 225°C;
- (3) drying the heat-treated compound from step (a) or step (b) to produce one or more shaped bodies suitable for use in the reduction of sulfur from gasoline;
- (4) heat treating the shaped bodies from step (c) at a temperature of about 300°C or higher to produce one or more calcined shaped bodies;
- (5) hydrating the calcined shaped bodies from step (d) to produce a hydrotalcite like compound; and
- (6) optionally heating the hydrotalcite like compound to remove substantially all of the interstitial water and/or anions to produce a collapsed hydrotalcite like compound;

wherein the hydrotalcite like compound has an XRD pattern which has a 2 theta peak position nearly identical to those found in an ICDD card selected from ICDD card 35-965; ICDD; ICDD Card No. 35-1275; or ICDD Card No. 35-0964; and

(b) reducing the sulfur content of gasoline undergoing cracking during the FCC process cycle.

31. The method according to claim 30, further comprising a support comprising a spinel, magnesia, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide,

magnesium carbonate, magnesium formate, magnesium aluminate, hydrous magnesium silicate, magnesium silicate, magnesium calcium silicate, aluminum silicate, calcium silicate, alumina, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, an aluminum hydroxide compounds, an aluminum-containing metal oxide compound other than alumina or an aluminum hydroxide compound, aluminum chlorohydrate, silica, silicon-containing compound other than silica, silica/alumina, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof.

32. The method according to claim 30, wherein X is magnesium (Mg) and Y is aluminum (Al).

33. The method according to claim 32, wherein the molar ratio of Mg:Al is from 1:1 to 10:1; and wherein the hydrotalcite like compound has an X-ray diffraction (XRD) pattern displaying at least a reflection at a two theta peak position between 8 and 15 degrees.

34. The method according to claim 30, further comprising at least one metallic oxidant, wherein the metal in the metallic oxidant is selected from antimony, bismuth, cadmium, chromium, cobalt, copper, dysprosium, erbium, europium, gadolinium, germanium, gold, holmium, iridium, iron, lanthanum, lead, manganese, molybdenum, neodymium, nickel, niobium, osmium, palladium, platinum, praseodymium, promethium, rhenium, rhodium, ruthenium, samarium, scandium, selenium, silicon, silver, sulfur, tantalum, tellurium, terbium, tin, titanium, tungsten, thulium, ytterbium, yttrium, zinc, or a mixture of two or more thereof.

35. The method according to claim 34, wherein the at least one metallic oxidant is present in an amount of at least 15% by weight, calculated as the oxide equivalent.

36. The method according to claim 30, wherein the divalent metal cation in the divalent metal compound of the process step (1) is selected from Mg^{2+} , Ca^{2+} , Zn^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Sr^{2+} , Ba^{2+} , Cu^{2+} or a mixture of two or more thereof.

37. The method according to claim 30, wherein the trivalent metal cation in the trivalent metal compound of the process step (1) is selected from Al^{3+} , Mn^{3+} , Fe^{3+} , Co^{3+} , Ni^{3+} , Cr^{3+} , Ga^{3+} , B^{3+} , La^{3+} , Gl^{3+} , Ce^{3+} , or a mixture of two or more thereof.

38. The method according to claim 30, wherein the divalent metal compound in the process of step (1) is selected from magnesium oxide, magnesium hydroxy acetate, magnesium acetate, magnesium hydroxide, magnesium nitrate, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium chloride, magnesium aluminate, hydrous magnesium silicate, magnesium calcium silicate, and mixtures of two or more thereof.

39. The method according to claim 30, wherein the trivalent metal compound in the process of step (1) is selected from aluminum hydroxide hydrate, aluminum oxide, aluminum acetate, aluminum nitrate, aluminum hydroxide, aluminum carbonate, aluminum formate, aluminum chloride, hydrous aluminum silicate, aluminum calcium silicate, and mixtures of two or more thereof.

40. The method according to claim 30, wherein, in step (1) of the process, in the mixed metal oxide compounds, the ratio of the divalent metal cation to the trivalent metal cation is selected from about 1:1 to about 10:1; from about 1:1 to about 6:1; from about 1.5:1 to about 6:1; or from about 2:1 to about 5:1.

41. The method according to claim 30, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount selected from of least 1 ppm, at least 2 ppm, or at least 5 ppm.

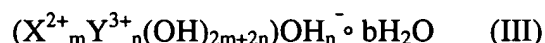
42. The method according to claim 30, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount of about 5% or more of the inventory of the regenerator.

43. The method according to claim 30, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount of about 10% or more of the inventory of the regenerator.

44. A method for reducing the concentration of sulfur in gasoline produced in an FCC unit comprising:

(a) adding to the FCC unit during an FCC process cycle an effective amount of one or more shaped bodies, comprising:

(i) a hydrotalcite like compound of formula (III):



wherein X is magnesium, calcium, zinc, manganese, cobalt, nickel, strontium, barium, copper or a mixture of two or more thereof; Y is aluminum, manganese, iron, cobalt, nickel, chromium, gallium, boron, lanthanum, cerium or a mixture of two or more thereof; b is between 0 and 10; and m and n are selected so that the ratio of m/n is about 1 to about 10; said hydrotalcite like compound prepared by a process comprising:

- (1) reacting an aqueous mixture comprising at least one divalent metal compound and at least one trivalent metal compound to produce a mixed metal oxide compound in the form of an aqueous slurry;
- (2) optionally heat treating the mixed metal oxide compound from step (a) at a temperature up to about 225°C;
- (3) drying the heat-treated compound from step (a) or step (b) to produce one or more shaped bodies suitable for use in the reduction of sulfur from gasoline;
- (4) heat treating the shaped bodies from step (c) at a temperature of about 300°C or higher to produce one or more calcined shaped bodies;
- (5) hydrating the calcined shaped bodies from step (d) to produce a hydrotalcite like compound; and
- (6) optionally heating the hydrotalcite like compound to remove substantially all of the interstitial water and/or anions to produce a collapsed hydrotalcite like compound;

wherein the hydrotalcite like compound has an XRD pattern which has a 2 theta peak position nearly identical to that found in an ICDD card selected from ICDD card 35-965; ICDD; ICDD Card No. 35-1275; or ICDD Card No. 35-0964; and

(ii) at least one metallic oxidant, wherein the metal in the metallic oxidant is selected from antimony, bismuth, cadmium, chromium, cobalt, copper, dysprosium, erbium, europium, gadolinium, germanium, gold, holmium, iridium, iron, lanthanum, lead, manganese, molybdenum, neodymium, nickel, niobium, osmium, palladium, platinum, praseodymium, promethium, rhenium, rhodium, ruthenium, samarium, scandium, selenium, silicon, silver, sulfur, tantalum, tellurium, terbium, tin, titanium, tungsten, thulium, ytterbium, yttrium, zinc, or a mixture of two or more thereof; and

(b) reducing the sulfur content of gasoline undergoing cracking during the FCC process cycle.

45. The method according to claim 44, further comprising a support comprising a spinel, magnesite, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium aluminate, hydrous magnesium silicate, magnesium silicate, magnesium calcium silicate, aluminum silicate, calcium silicate, alumina, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, an aluminum hydroxide compounds, an aluminum-containing metal oxide compound other than alumina or an aluminum hydroxide compound, aluminum chlorohydrate, silica, silicon-containing compound other than silica, silica/alumina, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof.

46. The method according to claim 44, wherein X is magnesium (Mg) and Y is aluminum (Al).

47. The method according to claim 46, wherein the molar ratio of Mg:Al is from 1:1 to 10:1; and wherein the hydrotalcite like compound has an X-ray diffraction (XRD) pattern displaying at least a reflection at a two theta peak position between 8 and 15 degrees.

48. The method according to claim 44, wherein the at least one metallic oxidant is present in an amount of at least 15% by weight, calculated as the oxide equivalent.

49. The method according to claim 44, wherein the divalent metal cation in the divalent metal compound of the process step (1) is selected from Mg^{2+} , Ca^{2+} , Zn^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Sr^{2+} , Ba^{2+} , Cu^{2+} or a mixture of two or more thereof.

50. The method according to claim 44, wherein the trivalent metal cation in the trivalent metal compound of the process step (1) is selected from Al^{3+} , Mn^{3+} , Fe^{3+} , Co^{3+} , Ni^{3+} , Cr^{3+} , Ga^{3+} , B^{3+} , La^{3+} , Gl^{3+} , Ce^{3+} , or a mixture of two or more thereof.

51. The method according to claim 44, wherein the divalent metal compound in the process of step (1) is selected from magnesium oxide, magnesium hydroxy acetate, magnesium acetate, magnesium hydroxide, magnesium nitrate, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium chloride, magnesium aluminate, hydrous magnesium silicate, magnesium calcium silicate, and mixtures of two or more thereof.

52. The method according to claim 44, wherein the trivalent metal compound in the process of step (1) is selected from aluminum hydroxide hydrate, aluminum oxide, aluminum acetate, aluminum nitrate, aluminum hydroxide, aluminum carbonate, aluminum formate, aluminum chloride, hydrous aluminum silicate, aluminum calcium silicate, and mixtures of two or more thereof.

53. The method according to claim 44, wherein, in step (1) of the process, in the mixed metal oxide compounds, the ratio of the divalent metal cation to the trivalent metal cation is selected from about 1:1 to about 10:1; from about 1:1 to about 6:1; from about 1.5:1 to about 6:1; or from about 2:1 to about 5:1.

54. The method according to claim 44, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount selected from of least 1 ppm, at least 2 ppm, or at least 5 ppm.

55. The method according to claim 44, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount of about 5% or more of the inventory of the regenerator.

56. The method according to claim 44, wherein the hydrotalcite shaped bodies are added to the FCC unit in an amount of about 10% or more of the inventory of the regenerator.

57. A method of reducing the concentration of sulfur in gasoline produced in an FCC unit comprising:

(a) adding to the FCC unit during an FCC process cycle an effective amount of one or more mixed metal oxide compounds prepared by a process comprising:

- (1) reacting an aqueous mixture comprising at least one divalent metal compound and at least one trivalent metal compound to produce a mixed metal oxide compound in the form of an aqueous slurry;
- (2) optionally heat treating the mixed metal oxide compound from step (a) at a temperature up to about 225°C to produce a heat-treated mixed metal oxide compound in the form of an aqueous slurry;
- (3) drying the heat-treated compound from step (b) to produce one or more shaped bodies of the mixed metal oxide compound suitable for use in the reduction of sulfur from gasoline; and, optionally,
- (4) optionally heat treating the shaped bodies from step (c) at a temperature of about 300°C or higher to produce one or more calcined shaped bodies of a mixed metal oxide compound; and

(b) reducing the sulfur content of gasoline undergoing cracking during the FCC process cycle.

58. The method according to claim 57, wherein the divalent metal cation in the divalent metal compound of the process step (1) is selected from Mg^{2+} , Ca^{2+} , Zn^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Sr^{2+} , Ba^{2+} , Cu^{2+} or a mixture of two or more thereof.

59. The method according to claim 57, wherein the trivalent metal cation in the trivalent metal compound of the process step (1) is selected from Al^{3+} , Mn^{3+} , Fe^{3+} , Co^{3+} , Ni^{3+} , Cr^{3+} , Ga^{3+} , B^{3+} , La^{3+} , Gl^{3+} , Ce^{3+} , or a mixture of two or more thereof.

60. The method according to claim 57, wherein the divalent metal compound in the process of step (1) is selected from magnesium oxide, magnesium hydroxy acetate, magnesium acetate, magnesium hydroxide, magnesium nitrate, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium chloride, magnesium aluminate, hydrous magnesium silicate, magnesium calcium silicate, and mixtures of two or more thereof.

61. The method according to claim 57, wherein the trivalent metal compound in the process of step (1) is selected from aluminum hydroxide hydrate, aluminum oxide, aluminum acetate, aluminum nitrate, aluminum hydroxide, aluminum carbonate, aluminum formate, aluminum chloride, hydrous aluminum silicate, aluminum calcium silicate, and mixtures of two or more thereof.

62. The method according to claim 57, wherein, in step (1) of the process, in the mixed metal oxide compounds, the ratio of the divalent metal cation to the trivalent metal cation is selected from about 1:1 to about 10:1; from about 1:1 to about 6:1; from about 1.5:1 to about 6:1; or from about 2:1 to about 5:1.

63. The method according to claim 57, further comprising a support comprising a spinel, magnesia, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium aluminate, hydrous magnesium silicate, magnesium silicate, magnesium calcium silicate, aluminum silicate, calcium silicate, alumina, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, an aluminum hydroxide compounds, an aluminum-containing metal oxide compound other than alumina or an aluminum hydroxide compound, aluminum

chlorohydrate, silica, silicon-containing compound other than silica, silica/alumina, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof.

64. The method according to claim 57, wherein the mixed metal oxide compounds are added to the FCC unit in an amount selected from of least 1 ppm, at least 2 ppm, or at least 5 ppm.

65. The method according to claim 57 wherein the mixed metal oxide compounds are added to the FCC unit in an amount of about 5% or more of the inventory of the regenerator.

66. The method according to claim 57, wherein the mixed metal oxide compounds are added to the FCC unit in an amount of about 10% or more of the inventory of the regenerator.

67. A method for reducing the concentration of sulfur in gasoline produced in an FCC unit comprising:

(a) adding to the reactor unit of an FCC unit during an FCC process cycle an effective amount of shaped bodies, comprising:

(i) a hydrotalcite like compound having an XRD pattern which has a 2 theta peak position nearly identical to that found in an ICDD card selected from ICDD card 35-965, ICDD Card No. 35-1275; or ICDD Card No. 35-0964, produced by a process comprising:

- (1) reacting an aqueous mixture comprising at least one divalent metal compound and at least one trivalent metal compound to produce a mixed metal oxide compound in the form of an aqueous slurry;
- (2) optionally heat treating the mixed metal oxide compound from step (a) at a temperature up to about 225°C;
- (3) drying the heat-treated compound from step (a) or step (b) to produce one or more shaped bodies suitable for use in the reduction of sulfur from gasoline;
- (4) heat treating the shaped bodies from step (c) at a temperature of about 300°C or higher to produce one or more calcined shaped bodies;

- (5) hydrating the calcined shaped bodies from step (d) to produce a hydrotalcite like compound; and
- (6) optionally heating the hydrotalcite like compound to remove substantially all of the interstitial water and/or anions to produce a collapsed hydrotalcite like compound;
- (ii) a support comprising a spinel, magnesite, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium aluminate, hydrous magnesium silicate, magnesium silicate, magnesium calcium silicate, aluminum silicate, calcium silicate, alumina, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, an aluminum hydroxide compounds, an aluminum-containing metal oxide compound other than alumina or an aluminum hydroxide compound, aluminum chlorohydrate, silica, silicon-containing compound other than silica, silica/alumina, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof; and
- (iii) one or more metallic oxidants selected from antimony, bismuth, cadmium, cerium, chromium, cobalt, copper, dysprosium, erbium, europium, gadolinium, germanium, gold, holmium, iridium, iron, lanthanum, lead, manganese, molybdenum, neodymium, nickel, niobium, osmium, palladium, platinum, praseodymium, promethium, rhenium, rhodium, ruthenium, samarium, scandium, selenium, silicon, silver, sulfur, tantalum, tellurium, terbium, tin, titanium, tungsten, thulium, vanadium, ytterbium, yttrium, zinc, or a mixture of two or more thereof; and
- (b) reducing the sulfur content of gasoline undergoing cracking during the FCC process cycle.

68. The method according to claim 67, wherein the divalent metal cation in the divalent metal compound of the process step (1) is selected from Mg^{2+} , Ca^{2+} , Zn^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Sr^{2+} , Ba^{2+} , Cu^{2+} or a mixture of two or more thereof.

69. The method according to claim 67, wherein the trivalent metal cation in the trivalent metal compound of the process step (1) is selected from Al^{3+} , Mn^{3+} , Fe^{3+} , Co^{3+} , Ni^{3+} , Cr^{3+} , Ga^{3+} , B^{3+} , La^{3+} , Gl^{3+} , Ce^{3+} , or a mixture of two or more thereof.

70. The method according to claim 67, wherein the divalent metal compound in the process of step (1) is selected from magnesium oxide, magnesium hydroxy acetate, magnesium acetate, magnesium hydroxide, magnesium nitrate, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium chloride, magnesium aluminate, hydrous magnesium silicate, magnesium calcium silicate, and mixtures of two or more thereof.

71. The method according to claim 67, wherein the trivalent metal compound in the process of step (1) is selected from aluminum hydroxide hydrate, aluminum oxide, aluminum acetate, aluminum nitrate, aluminum hydroxide, aluminum carbonate, aluminum formate, aluminum chloride, hydrous aluminum silicate, aluminum calcium silicate, and mixtures of two or more thereof.

72. The method according to claim 67, wherein, in step (1) of the process, in the mixed metal oxide compounds, the ratio of the divalent metal cation to the trivalent metal cation is selected from about 1:1 to about 10:1; from about 1:1 to about 6:1; from about 1.5:1 to about 6:1; or from about 2:1 to about 5:1.

73. The method according to claim 67, further comprising a support comprising a spinel, magnesia, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium aluminate, hydrous magnesium silicate, magnesium silicate, magnesium calcium silicate, aluminum silicate, calcium silicate, alumina, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, an aluminum hydroxide compounds, an aluminum-containing metal oxide compound other than alumina or an aluminum hydroxide compound, aluminum

chlorohydrate, silica, silicon-containing compound other than silica, silica/alumina, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof.

74. The method according to claim 67, wherein the shaped bodies are added to the FCC unit in an amount selected from of least 1 ppm, at least 2 ppm, or at least 5 ppm.

75. The method according to claim 67 wherein the shaped bodies are added to the FCC unit in an amount of about 5% or more of the inventory of the regenerator.

76. The method according to claim 67, wherein the shaped bodies are added to the FCC unit in an amount of about 10% or more of the inventory of the regenerator.

77. A method of reducing gasoline sulfur produced in an FCC unit comprising adding to the FCC unit an effective amount of at least one mixed metal oxide compound comprising magnesium and aluminum in a ratio of about 1:1 to about 10:1 and having an x-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees.

78. The method according to claim 77, wherein the ratio of magnesium to aluminum is about 1:1 to about 6:1.

79. The method according to claim 77, wherein the ratio of magnesium to aluminum is about 1.8:1 to about 5:1.

80. The method according to claim 77, wherein the ratio of magnesium to aluminum is about 2:1 to about 4:1.

81. The method of claim 77, wherein the compound is a shaped body.

82. The method of claim 81, wherein the shaped body is a dried shaped body.

83. The method of claim 81, wherein the shaped body is a calcined shaped body.

84. The method of claim 77, wherein the compound comprises magnesium in an amount of about 40% or more by weight, calculated as the oxide equivalent.

85. The method of claim 77, wherein the compound further comprises at least one metallic oxidant.

86. The method of claim 85, wherein the metal in the metallic oxidant is selected from antimony, bismuth, cadmium, cerium, chromium, cobalt, copper, dysprosium, erbium, europium, gadolinium, germanium, gold, holmium, iridium, iron, lanthanum, lead, manganese, molybdenum, neodymium, nickel, niobium, osmium, palladium, platinum, praseodymium, promethium, rhenium, rhodium, ruthenium, samarium, scandium, selenium, silicon, silver, sulfur, tantalum, tellurium, terbium, tin, titanium, tungsten, thulium, vanadium, ytterbium, yttrium, zinc, or a mixture of two or more thereof.

87. The method of claim 77, wherein the compound further comprises a support.

88. The method of claim 87, wherein the support comprises a spinel, hydrotalcite like compound, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide, magnesium carbonate, magnesium formate, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, aluminum hydroxide compound, aluminum-containing metal oxide compound, aluminum chlorohydrate, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof.

89. The method of claim 87, wherein the support is selected from zinc titanate, zinc aluminate, or zinc titanate/zinc aluminate.

90. The method according to claim 77, wherein the at least one mixed metal oxide compound is added to the FCC unit in an amount selected from of least 1 ppm, at least 2 ppm, or at least 5 ppm.

91. The method according to claim 77 wherein the at least one mixed metal oxide compound is added to the FCC unit in an amount of about 5% or more of the inventory of the regenerator.

92. The method according to claim 77, wherein the at least one mixed metal oxide compound is added to the FCC unit in an amount of about 10% or more of the inventory of the regenerator.

93. A gasoline reduction additive comprising at least one mixed metal oxide compound comprising magnesium and aluminum in a ratio of about 1:1 to about 10:1 and having an x-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees.

94. The additive according to claim 93, wherein the magnesium and aluminum ratio is about 1:1 to 6:1.

95. The additive according to claim 93, wherein the magnesium to aluminum ratio is 1:1 to 5:1.

96. The additive according to claim 93, wherein the magnesium and aluminum ratio is about 2:1 to 5:1.

97. The additive according to claim 93, wherein the mixed metal oxide compound comprises a solid solution in the form of one or more of a slurry, dried shaped bodies, or calcined shaped bodies.

98. The additive according to claim 93, further comprising a support comprising spinels, magnesia, magnesium acetates, magnesium nitrates, magnesium chlorides, magnesium hydroxides, magnesium carbonates, magnesium formates, magnesium aluminates, hydrous magnesium silicates, magnesium silicates, magnesium calcium silicates, aluminum silicates, boria, calcium silicates, alumina, aluminum titanates, zinc titanates, aluminum zirconates, calcium oxides, calcium aluminates, aluminum nitrohydrates, aluminum hydroxide compounds, aluminum chlorohydrates, silicas, silicon-containing compounds other than silicas,

silica/alumina, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof.

99. The additive according to claim 98, wherein the clays are selected from halloysite, rectorite, hectorite, montmorillinite, synthetic montmorillinite, sepiolite, activated sepeolite, kaolin, kieselguhr, celite, or bastnasite.

100. A method for reducing the concentration of sulfur in gasoline produced in an FCC unit comprising:

- (a) adding to the FCC unit during an FCC process cycle
 - (i) an effective amount of shaped bodies comprising a mixed metal oxide solid solution comprising magnesium and aluminum in a ratio of about 1.1 to about 10:1 and having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees,
 - (ii) a support comprising a spinel, magnesia, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium aluminate, hydrous magnesium silicate, magnesium silicate, magnesium calcium silicate, aluminum silicate, calcium silicate, alumina, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, an aluminum hydroxide compounds, an aluminum-containing metal oxide compound other than alumina or an aluminum hydroxide compound, aluminum chlorohydrate, silica, silicon-containing compound other than silica, silica/alumina, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof; and
 - (iii) at least one metallic oxidant selected from antimony, bismuth, cadmium, cerium, chromium, cobalt, copper, dysprosium, erbium, europium, gadolinium, germanium, gold, holmium, iridium, iron, lanthanum, lead, manganese, molybdenum, neodymium, nickel, niobium, osmium, palladium, platinum, praseodymium, promethium, rhenium, rhodium, ruthenium, samarium, scandium, selenium, silicon, silver, sulfur, tantalum, tellurium, terbium,

tin, titanium, tungsten, thulium, vanadium, ytterbium, yttrium, zinc, or a mixture of two or more thereof; and

(b) reducing the sulfur content of gasoline undergoing cracking during the FCC process cycle.

101. The method according to claim 100, further comprising a hydrotalcite like compound.

102. The method according to claim 101, wherein the hydrotalcite like compound is a calcined hydrotalcite like compound.

103. The method according to claim 101, wherein the hydrotalcite like compound is a collapsed hydrotalcite like compound.

104. A method for reducing gasoline sulfur comprising:

contacting a catalytic cracking feedstock with a mixed metal oxide compound comprising magnesium and aluminum and having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees, wherein the ratio of magnesium to aluminum in the compound is from about 1:1 to about 10:1, and (ii) about 1 wt% to about 75 wt% of a hydrotalcite like compound.

105. The method of claim 104, where the compound is heated prior to contacting the compound with the feedstock.

106. The method of claim 104, wherein the ratio of magnesium to aluminum is about 1.8:1 to about 5:1.

107. The method of claim 104, wherein the ratio of magnesium to aluminum is about 1:1 to about 5:1.

108. The method of claim 104, wherein the ratio of magnesium to aluminum is about 2:1 to about 4:1.

109. The method of claim 104, wherein the compound is a shaped body.
110. The method of claim 109, wherein the shaped body is a dried shaped body.
111. The method of claim 109, wherein the shaped body is a calcined shaped body.
112. The method of claim 104, wherein the compound comprises magnesium in an amount of about 40% or more by weight, calculated as the oxide equivalent.
113. The method of claim 104, wherein the compound comprises (i) about 99 wt% to about 50 wt% of a compound comprising magnesium and aluminum and having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees, wherein the ratio of magnesium to aluminum in the compound is from about 1:1 to about 6:1, and (ii) about 1 wt% to about 50 wt% of a hydrotalcite like compound.
114. The method according to claim 113, wherein the compound comprises (i) about 99 wt% to about 75 wt% of a compound comprising magnesium and aluminum and having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees, wherein the ratio of magnesium to aluminum in the compound is from about 1:1 to about 6:1, and (ii) about 1 wt% to about 25 wt% of a hydrotalcite like compound.
115. The method according to claim 114, wherein the compound comprises (i) about 95 wt% to about 75 wt% of a compound comprising magnesium and aluminum and having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees, wherein the ratio of magnesium to aluminum in the compound is from about 1:1 to about 6:1, and (ii) about 5 wt% to about 25 wt% of a hydrotalcite like compound.
116. The method according to claim 104, wherein the compound further comprises at least one metallic oxidant.
117. The method according to claim 116, wherein the metal in the metallic oxidant is

antimony, bismuth, cadmium, cerium, chromium, cobalt, copper, dysoprosium, erbium, europium, gadolinium, germanium, gold, holmium, iridium, iron, lanthanum, lead, manganese, molybdenum, neodymium, nickel, niobium, osmium, palladium, platinum, praseodymium, promethium, rhenium, rhodium, ruthenium, samarium, scandium, selenium, silicon, silver, sulfur, tantalum, tellurium, terbium, tin, titanium, tungsten, thulium, vanadium, ytterbium, yttrium, zinc, or a mixture of two or more thereof.

118. The method according to claim 104, wherein the compound further comprises a support.

119. The method according to claim 118, wherein the support comprises a spinel, hydrotalcite like compound, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide, magnesium carbonate, magnesium formate, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, aluminum hydroxide compound, aluminum-containing metal oxide compound, aluminum chlorohydrate, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof.

120. The method according to claim 119, wherein the support comprises zinc titanate, zinc aluminate, or zinc titanate/zinc aluminate.

121. A gasoline reduction additive comprising at least one compound having an x-ray diffraction pattern displaying at least a reflection at a two theta peak position of about 11 degrees, 23 degrees and 34 degrees and comprising (i) at least one metallic oxidant selected from antimony, bismuth, cadmium, cerium, chromium, cobalt, copper, dysoprosium, erbium, europium, gadolinium, germanium, gold, holmium, iridium, iron, lanthanum, lead, manganese, molybdenum, neodymium, nickel, niobium, osmium, palladium, platinum, praseodymium, promethium, rhenium, rhodium, ruthenium, samarium, scandium, selenium, silicon, silver, sulfur, tantalum, tellurium, terbium, tin, titanium, tungsten, thulium, vanadium, ytterbium, yttrium, zinc, or a mixture of two or more thereof, and (ii) a support comprising spinels, magnesia, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide,

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magnesium carbonate, magnesium formate, magnesium aluminate, hydrous magnesium silicate, magnesium silicate, magnesium calcium silicate, aluminum silicate, calcium silicate, alumina, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, an aluminum hydroxide compounds, an aluminum-containing metal oxide compound other than alumina or an aluminum hydroxide compound, aluminum chlorohydrate, silica, silicon-containing compound other than silica, silica/alumina, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof.